



# REGULATORY GUIDE

## NEBRASKA DEPARTMENT OF HEALTH AND HUMAN SERVICES REGULATION AND LICENSURE

### REGULATORY GUIDE 4.5

#### PLANNED SPECIAL EXPOSURES

##### A. INTRODUCTION

In the revised 180 NAC 4, "Standards for Protection Against Radiation," paragraphs 180 NAC 4-005.02 and 4-010 provide the conditions and limits for planned special exposures (PSEs) of adult workers, i.e., doses in addition to and accounted for separately from the doses received under the limits specified in 180 NAC 4-005. In addition, 180 NAC 4-009.02 and 004-009.05, item 2 specify the requirements for obtaining prior occupational dose information, and 180 NAC 4-051 and 4-053 specify the requirements for exposure and monitoring records applicable to PSEs. The requirements for reporting PSEs are in 180 NAC 4-058.05 and 4-060.

Planned special exposure (PSE) means an infrequent exposure to radiation, separate from and in addition to the annual occupation dose limits.

PSEs have been included in the revised 180 NAC 4 to provide for exceptional situations when alternatives that might avoid the special exposure are unavailable or impractical. The previous rule's 5(N-18) provision, which permitted accumulating unused annual exposures for use in dose averaging (or a dose bank), has been deleted. Under the revised rule, if the worker's exposure is under the 5-rem annual dose limit, there is no way to recapture the difference between the actual dose and the limit for use in future years.

The PSE rule is designed to provide occupational dose flexibility similar to that provided by the previous 5(N-18) rule. Thus, even though doses cannot be "banked" or saved as before, the revised rule will allow 5 rems occupational exposure and 5 rems PSE for a total of 10 rems for the year, which is similar to the maximum amount of 12 rems allowed under the previous 5(N-18) rule. The difference is that there are additional conditions that must be satisfied prior to allowing the special exposure. These conditions are detailed in 180 NAC 4-052, and this provision is intended to be used only under very special circumstances,

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Comments and suggestions for improvements in these Regulatory Guides are encouraged at all times and they will be revised, as appropriate, to accommodate comments and to reflect new information or experience. Comments should be sent to the Nebraska Department of Health and Human Services, Regulation and Licensure, Public Health Assurance Division, X-ray Program, 301 Centennial Mall South, P.O. Box 95007, Lincoln, NE 68509.

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not as a routine measure for extending dose limits applicable to routine exposures. In addition, there are requirements for recording and reporting the PSE.

This regulatory guide provides guidance on the conditions and prerequisites for permitting PSEs allowed by the revision to 180 NAC 4, the associated specific monitoring and reporting requirements, and examples of acceptable means of satisfying these requirements.

Any information collection activities mentioned in this regulatory guide are contained as requirements in 180 NAC 4, which provides the regulatory basis for this guide.

## **B. DISCUSSION**

PSEs are restricted to those special situations that could result in a higher exposure than allowed by the normal limits of 180 NAC 4-005 and that, if not provided for, could create a severe problem in the licensee's operations. Problems might include unscheduled facility shutdowns, high radiation levels that impede operations important to safety. Accordingly, a special set of limitations and reporting and recordkeeping requirements apply if licensees decide to use PSEs. Approval of a PSE for an adult worker must be in writing before the exposure occurs and, once it occurs, the exposure cannot be treated as a routine occupational exposure. Furthermore, minors are not allowed to participate in PSEs.

In planning for a PSE, the licensee is permitted to assign a portion of the dose to routine exposure and the rest to the PSE. However, when the post exposure evaluation is made, the dose amount planned to be assigned to PSE must be recorded as PSE. If the total dose received is less than the planned PSE, the actual dose received must be recorded as PSE dose. If the total dose received is more than the planned PSE, but not an overexposure, the extra portion may be recorded as PSE or routine dose. In other words, the planned PSE dose cannot be reassigned, postexposure, to routine exposure if it is later determined that a PSE was not needed. The intent of the PSE was that it would be used infrequently. Once a licensee decides to conduct a PSE, all the unique limitations and reporting and record keeping requirements are to apply, even if the doses actually received fall within the dose limits for routine operations. For example, if a job planned with a PSE of 5 rems and a routine dose of 2 rems to an individual actually results in a dose of 4 rems, the entire 4-rem dose must be recorded as PSE dose.

In determining the amount to assign to the PSE in advance of the exposures, licensees should be aware of the individual's current year exposure and lifetime PSE bank to avoid unnecessarily impacting a worker's employability.

## **C. REGULATORY POSITION**

### **1. USE OF PLANNED SPECIAL EXPOSURES**

PSEs are only to be used under exceptional circumstances, not as a routine method of increasing dose limits applicable to routine exposures. However, licensees may consider the use of PSEs to permit workers who have critical skills and who are necessary for a particular job to receive an exposure in addition to the routine occupational exposure limit.

The rule does not require that participation in PSEs be voluntary on the part of the individual workers. However, licensees may establish a program of voluntary PSEs. In any case, consideration should be given to the potential benefits of involving the worker in the planning and preparation for the PSE. The Agency believes that the risk of suffering health effects from these limited exposures is small and that the use of PSEs may be necessary for licensees to accomplish important tasks vital to continued safe operations. The issue of a worker accepting the risks associated with an assigned task is discussed in NRC (Nuclear Regulatory Commission) Regulatory Guide 8.29, "Instruction Concerning Risks from Occupational Radiation Exposure."

Exposures in excess of the routine occupational dose limits received during accident or emergency situations that require immediate action to save human lives or to prevent the failure of equipment important to safety are not PSEs. However, if conditions associated with an accident or emergency

permit complying with the conditions specified in 180 NAC 4-010, item 1 through 5, a PSE can be used. However, all exposures in excess of the routine occupational dose limits received during accident and emergency situations must be determined and subtracted from the annual 5-rem PSE limit and the 25 rems allowed for lifetime PSEs (see 180 NAC 4-010, item 5).

## 2. CONDITIONS FOR USE OF PSEs

There are seven conditions listed in 180 NAC 4-010 that must be satisfied if a licensee authorizes an adult worker to receive a PSE. These conditions are presented in Figure 1 and are discussed below.

**FIGURE 1**

### **Conditions for Planned Special Exposures**

- Exceptional Situation
- Prior Written Authority
- Individual Informed and Instructed
- Doses from Previous PSEs and Doses in Excess of Annual Dose Limits Determined
- PSEs Plus All Occupational Exposure Over Annual Limits Must Be:  
 $\leq$ Dose Limits for 1 Year and  $\leq 5 \times$  Annual Dose Limits for a Lifetime
- Records Maintained of Conduct of PSE, Written Report of PSE to the Agency
- PSE Dose Recorded and Individual Informed of Dose Within 30 Days

### 2.1 Exceptional Situations

Authorization for PSEs should only be given for exceptional situations. The use of PSEs must be justified and well documented (see 180 NAC 4-052). PSEs should not be used as a routine method of increasing a worker's routine exposure limits. The justification for the PSE will be reviewed by the Agency staff when the licensee's records of the PSE are examined. If a licensee would like an Agency review prior to initiating a PSE, the licensee may contact the appropriate regional office directly.

The following are examples of exceptional situations in which a PSE might be justified:

**The work is to be performed by one individual rather than several.** A source becomes disconnected during radiography. It may not be practical or feasible for the source to be recovered in two or three steps by different persons. Authorization for one person to receive up to 5 rems total effective dose equivalent, in addition to his or her routine occupational exposure, may be reasonable for the recovery.

The licensee is permitted to use previously approved procedures in carrying out work under a PSE. For example, the licensee could have an approved generic procedure for source retrieval that, among other things, addresses all the administrative and recordkeeping requirements of 180 NAC 4-010. Provided the situation is exceptional and alternatives that might avoid higher exposures are unavailable or are impractical, an individual's exposure received during such a source retrieval may be considered as a PSE. All the conditions of 180 NAC 4-010 must be met and documented prior to each exposure.

**Use of dose-averting methods are not possible.** Work must be performed on instrumentation in a high-radiation area where space is very limited and shielding or other dose-averting methods are not possible. It may be necessary to authorize a PSE to make the necessary repairs to the instrumentation.

**Collective dose to personnel may be reduced.** It may be more dose effective to keep certain skilled workers on a particular job because they will be able to perform the job rapidly and reduce the overall dose to personnel. For example, if two persons can weld in a high radiation area and collectively receive 12 rems (6 rems per person, 2 rems under a PSE and 4 rems routine) while four less skilled workers would receive 16 rems (4 rems per person routine exposure), the collective dose would be reduced from 16 to 12 rems by using the two skilled workers. PSEs are not intended to be used only as a routine collective dose reduction technique. However, reducing collective dose could contribute to the justification of the need for a PSE.

## **2.2 Prior Written Authority**

The licensee (and employer if the employer is not the licensee) must specifically authorize the PSE in writing before the exposure occurs. A contractor employer may authorize the use of PSEs by a licensee in advance to accommodate any urgent circumstances that may arise. If, prior to initiating a PSE, it is found that a PSE is not needed, the resulting exposure can be recorded as routine if the PSE is canceled.

The procedures for the radiation protection program should specify the management level that may authorize a PSE. The responsible person should be at a sufficiently senior level to ensure worker protection and to judge the appropriateness of the PSE for the exceptional circumstances. This person would normally be the RSO/radiation protection manager or someone in the organization with equivalent qualifications.

## **2.3 Individual Informed and Instructed**

Before a planned special exposure, the licensee must ensure that the individuals involved are (1) informed of the purpose of the planned operation, (2) informed of the expected radiation levels, estimated doses, and associated risks or other conditions that may be involved in performing the task, and (3) instructed in measures to be taken to keep the dose ALARA (as low as reasonably achievable) while considering other risks that may be present.

To ensure that the intent of the plan is carried out, it is important that the workers who are to receive a PSE are fully informed and aware of the circumstances under which the PSE was authorized. These workers must understand the importance of keeping their exposure ALARA. They must also understand the procedures and controls to be used in the particular PSE in order to keep their exposures ALARA. Licensees have an obligation to inform workers (before they receive a PSE) of the expected radiation levels, estimated doses, associated risks, or other significant conditions that might be involved in performing the task so that the individuals are aware of and understand the health and safety significance of the PSE. This information should also be included on the authorization for the PSE.

## **2.4 Determine Prior Doses**

According to 180 NAC 4-010, item 4, prior to authorizing the PSE, all previous PSEs and all doses in excess of the routine occupational limits in effect at the time of the exposures (180 NAC 4-005.01) for the individual's lifetime must be determined from records for each individual who will participate in the PSE. Doses received in excess of routine occupational dose limits in effect at the time of the exposures during accidents and emergencies must also be determined and subtracted from the limits for PSEs. (Accident doses are doses resulting from an unexpected event involving exposure to radiation or radioactive material. Emergency doses are doses resulting from any immediate action taken in response to a situation or occurrence of a serious nature developing suddenly and unexpectedly.)

If complete records (including the provisions of 180 NAC 4-009.03) of the worker's current and previously accumulated occupational dose such as a completed Agency Form NRH-1 are not available, it must be assumed that the individual is not eligible for PSEs, i.e., the person cannot be authorized to receive a PSE (see 180 NAC 4-009.05, item 2). Guidance on records of

occupational exposure is available in Regulatory Guide 4.0, "Instructions for Recording and Reporting Occupational Radiation Exposure Data."

## **2.5 PSEs and Exposure Limits**

Individuals receiving PSEs can receive a maximum dose in 1 year of any or all of the following:

1. 10 rems total effective dose equivalent (5 rems from routine operations and 5 rems from PSEs); or  
  
100 rems to any individual organ or tissue, including any deep-dose equivalent plus the committed dose equivalent for the organ or tissue (50 rems from routine operations and 50 rems from PSEs); and
2. 30 rems dose equivalent to the eye (15 rems from routine operations and 15 rems from PSEs); and
3. 100 rems to the skin or to any extremity (50 rems from routine operations and 50 rems from PSEs).

Individuals can receive a lifetime dose from PSEs of any or all of the following:

1. 25 rems total effective dose equivalent; or 250 rems to any individual organ or tissue; and
2. 75 rems to the eye; and
3. 250 rems to the skin or to any extremity.

## **2.6 Records and Written Reports**

The licensee must maintain records of the conduct of a PSE in accordance with 180 NAC 4-051 and must submit a written report in accordance with 180 NAC 4-060. In addition, 180 NAC 4-052 requires that the records of doses received during PSEs be maintained for all individuals who participated in a PSE. These records should include all the information listed in 180 NAC 4-051. A revised Agency Form NRH-2 has been developed, along with guidance on its use, in Regulatory Guide 4.0, "Instructions for Recording and Reporting Occupational Radiation Exposure Data."

A written report of the PSE, notifying the Agency, is due within 30 days after the PSE has occurred (see 180 NAC 4-061). The report allows the Agency to assess the actual frequency of PSEs and determine whether follow up inspections may be warranted. The information in the records listed in 180 NAC 4-051 must be included in any report filed under 180 NAC 4-060.

## **2.7 Recording Worker's PSE Dose and Informing the Worker**

The licensee must record its best estimate of the dose (dose of record) resulting from the PSE in each affected individual's record and inform the individual, in writing, of the dose within 30 days of the PSE (180 NAC 4-010, item 7). The dose from PSEs is not to be considered in controlling future occupational dose of the individual under 180 NAC 4-005.01 but is to be included in evaluations required by 180 NAC 4-10, item 4 and 5. The dose resulting from a PSE is to be included in the total for all PSEs for the individual, and it is to be used in determining the dose balance remaining for future PSEs.

The 30-day time period for notifying the worker of the dose received is to allow sufficient time for the licensee to make its best estimate of internal and external exposures received as part of the PSE. The best estimate is understood to mean the dose of record as determined by accredited dosimetry, bioassay, air sampling, or other analyses such as time and motion studies. If the

intake of Class Y material (i.e., materials that remain in the body for time periods on the order of years) is being assessed, the licensee may delay the recording and reporting of the results of its assessments for periods up to 7 months to allow for additional measurements necessary for the assessments (180 NAC 4-008.04). The internal dose reported within the 30 days may be identified as an initial best estimate pending completion of a final assessment after which the actual dose assigned should be recorded and reported.

The dose from a PSE must be tracked separately from the routine occupational dose for the individual. Thus, a person may have an accumulated routine occupational dose of 3 rems total effective dose equivalent for the year, receive a dose of 4 rems total effective dose equivalent from a PSE, and still be able to receive up to 2 more rems of routine occupational exposure for the year, even though the person has had a total dose of 7 rems for the year.

### **3. INTERNAL AND EXTERNAL EXPOSURE CONSIDERATIONS**

For PSEs, as well as for routine exposures, both internal and external doses are to be summed in calculating the total effective dose equivalent. This requires controlling the total effective dose equivalent but permits tradeoffs between internal and external exposures to be made to achieve ALARA doses. The sum of external and internal doses during the PSE should be maintained ALARA. The conditions specified in 180 NAC 4-022 should be used in making the determination of when monitoring is required.

### **4. EXPOSURES OF MINORS AND DECLARED PREGNANT WOMEN**

The PSE provisions of 180 NAC 4-010 do not apply to minors (180 NAC 4-011) or to the embryo/fetus (180 NAC 4-012). The rule permits a licensee to authorize only an adult worker to receive PSEs. In addition, the dose limits in 180 NAC 4-012 would normally preclude a declared pregnant woman from receiving a PSE since the 180 NAC 4-012 limits are more restrictive than the annual dose limits in 180 NAC 4-005. In general, declared pregnant women should not be considered candidates for PSEs. However, the provisions of 180 NAC 4-010 also apply to the dose limits for the lens of the eye, skin, and extremities. Therefore, in some situations it may be possible for a declared pregnant woman to receive a PSE to her extremities (or skin or eyes) that would not exceed the dose limits to the embryo/fetus.

## **D. IMPLEMENTATION**

The purpose of this section is to provide information to applicants and licensees regarding the Agency staff's plans for using this regulatory guide.

Except in those cases in which an applicant proposes an acceptable alternative method for complying with specified portions of the Agency's regulations, the methods described in this guide will be used in the evaluation of applications for new licenses, license renewals, and license amendments and for evaluating compliance with 180 NAC 4.